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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,100	04/07/2004	Zhong Dong	M-15295 US	8965
32605	7590	04/23/2010	EXAMINER	
Haynes and Boone, LLP			VU, DAVID	
IP Section			ART UNIT	
2323 Victory Avenue			PAPER NUMBER	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/821,100	<b>Applicant(s)</b> DONG ET AL.	
	<b>Examiner</b> DAVID VU	<b>Art Unit</b> 2818	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period **will** apply and **will** expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply **will**, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on Reply Brief dated 03/20/08.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 21-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15, 21-24, 26 and 27 is/are rejected.
- 7) ☐ Claim(s) 25 and 28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04/07/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

1. In view of the Reply Brief filed on 03/20/08, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is made in view of Lin et al. (US Pat. 6,127,227) and Wang et al. (US 2005/0110102) set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/STEVEN LOKE/

Supervisory Patent Examiner, Art Unit 2818.

## **Claim Rejections - 35 USC § 112**

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or

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with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 11 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original disclosure does not include teaching: “ONO-type memory cell stack does not include a metal silicide layer” (**claim 11**);

Applicant submit that support for claims is found in figure 3A. However, figure 3A and the specification as written do not exclude application of a metal silicide layer to an ONO-type memory cell stack.

Any response to this 112 rejection should include the location in the original disclosure where the subject matter can be found.

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to

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point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-15, 21-24, 26 and 27 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Lin et al. (US Pat. 6,127,227, hereinafter Lin) in view of Wang et al. (US 2005/0110102, hereinafter Wang).

Regarding claims 1-8, 10, 11, 15 and 21-24, Lin discloses in figs. 2A-2G a method of forming an ONO-type memory cell stack 160 where at least one sidewall of the ONO-type memory cell stack 160 includes a plurality of exposed material layers respectively composed of an oxide 143; an oxidizable material (nitride layer 145) disposed adjacent to the oxide 143; and an oxide 147.

Lin fails to disclose forming the sidewall oxide layer on ONO structure 140 by hydrogen and oxygen. However, Wang teaches that the sidewall oxide layer is formed by a dry ISSG process at a temperature is about 800-1000°C, the flow rate of  $H_2+O_2$  is about 1slm –40slm {See [0032]; [0038] and [0041]}, the pressure is about 1-20 Torr, the duration is about 30-120 seconds [0046]; the ratio of  $H_2/H_2+O_2$  is in the range about 0.1%-40%, therefore, the ratio  $H_2:O_2$  is about 0.01 (Let x be  $H_2$ , y be  $O_2$ ;  $x+y = 100\% = 1$  and  $x/(x+y) = 0.1$ ; we got  $x:y = 0.01$ ). It would have been obvious to one with ordinary skill in the art at the time of the invention to form an oxide film by using a dry ISSG process as taught by Wang in the process of Lin. As recognized by one skilled in the art, a dry ISSG process provides excellent thickness control and the thermal budget can be reduced (Abstract).

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Note that the dry ISSG process is often described as a process generates short lived oxygen radicals {See Xing et al. (US 20030124873) ([0026]-[0038]) for evidence of the state of the art in which atomic oxygen is created by an ISSG process}. Furthermore, the combination of Lin and Wang meet the structural and methodological limitations of this claim, thus they would (as an obvious consequence) also exhibit the same functional characteristics (i.e. generates short lived oxygen radicals whose reactivity extinguishes before the short lived oxygen radicals are able to permeate as deep into the ONO-type memory cell stack and oxidize materials therein as would the reactive oxygen of a High Temperature Oxidation (HTO) process applied to an essentially same ONO-type memory cell stack).

Regarding claim 9, Lin discloses exposed material layers of the ONO-type memory cell stack includes: an ONO stack 140 (fig. 2G).

Regarding claim 12, Lin and Wang fails to disclose a height variation ratio is about 1.20 or less. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of Lin and Wang by selecting a suitable thickness/height ratio in order to achieve a specific sidewall dielectric, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges for result effective variables involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Moreover, the specification contains no disclosure of either the critical nature of the claimed process/device (i.e. - thickness/height ratio) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must

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show that the chosen limitation are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990).

Regarding claims 13 and 14, as recognized by one skilled in the art that a larger erase speed is obtained in a memory cell after formation of the sidewall dielectric by the dry ISSG process {See Fujimoto et al. (US Pat. 6,830,973); col. 7, lines 32-38 and Applicants specification, paragraph [0039]}. Note that the combination of Lin and Wang meet the structural and methodological limitations of this claim, thus they would (as an obvious consequence) also exhibit the same functional characteristics.

Regarding claim 26, Wang teaches the ratio  $H_2$ :  $O_2$  is about 0.01 (which is below 0.3), therefore, it is inherent that the step of flowing the molecular hydrogen towards the stack is constrained to below a volumetric flow ratio of  $H_2$  to  $O_2$  at which formation of a hydrogen flame due to the presence of  $H_2$  is at least unstable if not that the flame is extinguished or unignited due to insufficient presence of  $H_2$  (see Reply Brief, filed on 03/20/08, page 26, lines 1-4).

Regarding claim 27, Wang teaches the ratio  $H_2$ :  $O_2$  is about 0.01 (which is below 0.3), therefore, it is inherent that the step of flowing the molecular hydrogen towards the stack is constrained to below a volumetric flow ratio of  $H_2$  to  $O_2$  at which stable ignition of a hydrogen flame due to the presence of  $H_2$  is assured on a mass production basis (see Reply Brief, filed on 03/20/08, page 26, lines 1-4).

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The art cited on the Notice of References is included as teaching the general state of the art relating to the instant invention.

**US Pat. 6,699,777 (Agarwal; figs. 7-9 and col. 3, lines 2-7 and 39-61 & col. 4, lines 16-41)** is cited as teaching a  $H_2O_2$  oxidation process is performed for forming an oxide spacer on a poly-metal memory cell stack.

#### **Allowable Subject Matter**

5. Claims 25 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### **Conclusion**

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke H can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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